

What is claimed is:

1. An optical measurement apparatus comprising:

a first light source for producing light of a first wavelength that is irradiated onto a light incident point on the surface of an examined subject;

a second light source for producing light of a second wavelength that is irradiated onto said light incident point on the surface of said subject from a direction different from that of the light of said first wavelength;

a first photodetector on which reflected light of the light of said first wavelength reflected by said light incident point and scattered light of the light of said second wavelength are incident;

a second photodetector for receiving reflected light of the light of said second wavelength reflected by said light incident point and scattered light of the light of said first wavelength; and

a third detector for receiving light leaving out of a region on the surface of said subject that is away from said light incident point.

2. An optical measurement apparatus comprising a first light source for producing light of a first wavelength, a second light source for producing light of a second wavelength, a first photodetector, a second photodetector and a third photodetector, wherein

said first and second light sources emit light in a time-divided manner such that a light incident point on the surface of an examined subject is irradiated with the light of said first wavelength and the light of said second wavelength in a time-divided manner,

mainly reflected light of the light of said first wavelength is incident on said first photodetector from said light incident point when said first light source is emitting, while mainly scattered light of the light of said second wavelength is incident thereon when said second light source is emitting,

mainly reflected light of the light of said second wavelength is incident on

said second photodetector from said light incident point when said second light source is emitting, while mainly scattered light of the light of said first wavelength is incident thereon when said first light source is emitting, and

said third photodetector is adapted to receive light that leaves out of a region on the surface of said subject which is away from said light incident point.

3. The optical measurement apparatus according to claim 1 or 2, wherein the plane of incidence of the light of said first wavelength on said light incident point on the subject surface is substantially perpendicular to the plane of incidence of the light of said second wavelength.

4. The optical measurement apparatus according to claim 3, wherein the outgoing light from said first light source is irradiated onto said light incident point via a first optical fiber, the outgoing light from said second light source is irradiated onto said light incident point via a second optical fiber, the light incident on said first photodetector is incident on said first photodetector via a third optical fiber, and the light incident on said second photodetector is incident on said second photodetector via a fourth optical fiber.

5. The optical measurement apparatus according to claim 4, wherein an outgoing end of said first optical fiber, outgoing end of said second optical fiber, incident end of said third optical fiber and incident end of said fourth optical fiber are disposed near the plane of a cone whose apex corresponds to said light incident point on the subject surface.

6. The optical measurement apparatus according to claim 4, further comprising a fifth optical fiber for transmitting the light leaving out of said region on the subject surface away from said light incident point to said third detector, wherein an incident end of said fifth optical fiber is disposed at such a position as to be in

contact with the subject surface.

7. The optical measurement apparatus according to claim 6, wherein the distance between said light incident point on the subject surface and the incident end of said fifth optical fiber is larger than the distance between said light incident point and the incident end of said third optical fiber or the incident end of said fourth optical fiber.

8. The optical measurement apparatus according to claim 7, wherein the incident end of said fifth optical fiber is disposed on the plane of incidence of the light of said first wavelength or the plane of incidence of the light of said second wavelength.

9. The optical measurement apparatus according to claim 7, wherein the incident end of said fifth optical fiber is disposed on a plane that makes an angle of approximately 45° with the plane of incidence of the light of said first wavelength or the plane of incidence of the light of said second wavelength.

10. The optical measurement apparatus according to claim 4, wherein the first wavelength is a wavelength at which the molar absorption coefficient of oxyhemoglobin is equal to that of deoxyhemoglobin, and said second wavelength is a wavelength for detecting the difference in absorbance between the oxyhemoglobin and deoxyhemoglobin.

11. The optical measurement apparatus according to claim 10, wherein measurement error due to the thickness of the skin is corrected using the intensity of light measured by said third detector.

12. The optical measurement apparatus according to claim 4, wherein a branch

optical fiber is connected to said first and/or second optical fiber, wherein a light source is disposed at the end of said branch optical fiber, said light source producing light of a wavelength different from those of said first and second light sources.

13. A blood sugar level measuring apparatus comprising:

(1) a heat amount measuring portion for measuring a plurality of temperatures derived from the body surface in order to obtain information that is used in calculating the amount of convective heat transfer and the amount of radiation heat transfer related to the dissipation of heat from the body surface;

(2) a blood flow volume measuring portion for obtaining information concerning the volume of blood flow;

(3) an optical measuring portion for obtaining the hemoglobin concentration and hemoglobin oxygen saturation in blood, said portion including a light source for generating light of at least two different wavelengths, an optical system for irradiating the body surface with light emitted by said light source, and at least three different photodetectors for detecting the light that has been shone on the body surface;

(4) a storage portion for storing the relationships between individual parameters corresponding to the multiple temperatures, blood flow volume, hemoglobin concentration and hemoglobin oxygen saturation in blood, and blood sugar levels;

(5) a computing portion for converting the measurement values provided by said heat amount measuring portion, said blood flow volume measuring portion, and said optical measuring portion into the aforementioned parameters, and computing a blood sugar level by applying said parameters to said relationships stored in said storage portion; and

(6) a display portion for displaying the blood sugar level computed by said computing portion, wherein

said optical measuring portion includes a first light source producing light of a first wavelength and emitting the light on a light incident point on the subject surface, a second light source producing light of a second wavelength and emitting the light on said light incident point on the subject surface from a direction different from that of the light of said first wavelength, a first photodetector, a second photodetector, and a third photodetector, wherein

reflected light of the light of said first wavelength reflected by said light incident point and scattered light of the light of said second wavelength are incident on said first photodetector;

reflected light of the light of said second wavelength reflected by said light incident point and scattered light of the light of said first wavelength are incident on said second photodetector; and

said third photodetector is adapted to detect light that leaves out of a region on the subject surface that is away from said light incident point.

14. The blood sugar-level measuring apparatus according to claim 13, wherein the plane of incidence of the light of said first wavelength on said light incident point on the subject surface is substantially perpendicular to the plane of incidence of the light of said second wavelength.

15. The blood sugar-level measuring apparatus according to claim 14, wherein the outgoing light from said first light source is irradiated onto said light incident point on the subject surface via a first optical fiber, the outgoing light from said second light source is irradiated onto said light incident point on the subject surface via a second optical fiber, the light incident on said first photodetector is incident on said first photodetector via a third optical fiber, and the light incident on said second photodetector is incident on said second photodetector via a fourth optical fiber.

16. The blood sugar-level measuring apparatus according to claim 15, wherein an outgoing end of said first optical fiber, outgoing end of said second optical fiber, incident end of said third optical fiber and incident end of said fourth optical fiber are disposed near the plane of a cone whose apex corresponds to said light incident point on the subject surface.

17. The blood sugar-level measuring apparatus according to claim 15, further comprising a fifth optical fiber for transmitting the light leaving out of said region on the subject surface away from said light incident point to said third detector, wherein an incident end of said fifth optical fiber is disposed at such a position as to be in contact with the subject surface.

18. The blood sugar-level measuring apparatus according to claim 15, wherein the incident end of said fifth optical fiber is disposed on the plane of incidence of the light of said first wavelength or the plane of incidence of the light of said second wavelength.

19. The blood sugar-level measuring apparatus according to claim 15, wherein the incident end of said fifth optical fiber is disposed on a plane that makes an angle of approximately 45° with the plane of incidence of the light of said first wavelength or the plane of incidence of the light of said second wavelength.

20. The blood sugar-level measuring apparatus according to claim 13, wherein the first wavelength is a wavelength at which the molar absorption coefficient of oxyhemoglobin is equal to that of deoxyhemoglobin, and said second wavelength is a wavelength for detecting the difference in absorbance between the oxyhemoglobin and deoxyhemoglobin.

21. The blood sugar-level measuring apparatus according to claim 13, wherein

said optical measuring portion further comprises a control portion for controlling the emission of light from said first and second light sources, wherein

said control portion causes said first and second light sources to emit light alternately, such that the light incident point on the subject surface is irradiated with the light of said first wavelength and the light of said second wavelength alternately,

mainly reflected light of the light of said first wavelength is incident on said first photodetector from said light incident point when said first light source is emitting, while mainly scattered light of the light of said second wavelength is incident thereon when said second light source is emitting,

mainly reflected light of the light of said second wavelength is incident on said second photodetector from said light incident point when said second light source is emitting, while mainly scattered light of the light of said first wavelength is incident thereon when said first light source is emitting.